ZooKeys 1068: 1–11 (2021)
doi: 10.3897/zookeys.1068.71925
https://zookeys.pensoft.net

RESEARCH ARTICLE

A peer-reviewed open-access journal
ZooKeys
Launched to accelerate biodiversity research

A new species and a new species record of Orbiniidae Hartman, 1942 (Annelida, Polychaeta) from China

Yue Sun[1], Lei Yu[1], Xinzheng Li[2,3,4,5]

1 *School of wetland, Jiangsu Provincial Key Laboratory of Coastal Wetland Bioresources and Environmental Protection, Jiangsu Key Laboratory for Bioresources of Saline Soils, Yancheng Teachers University, Yancheng 224051, China* **2** *Institute of Oceanology, Chinese Academy of Sciences, Qingdao 266071, China* **3** *Center for Ocean Mega-Science, Chinese Academy of Sciences, Qingdao 266071, China* **4** *University of Chinese Academy of Sciences, Beijing 200049, China* **5** *Laboratory for Marine Biology and Biotechnology, Qingdao National Laboratory for Marine Science and Technology, Qingdao, China*

Corresponding author: Xinzheng Li (lixzh@qdio.ac.cn)

Academic editor: C. Glasby | Received 23 July 2021 | Accepted 20 September 2021 | Published 02 November 2021

http://zoobank.org/A21BC65E-59A5-40AE-B9AE-61F2A7491B39

Citation: Sun Y, Yu L, Li X (2021) A new species and a new species record of Orbiniidae Hartman, 1942 (Annelida, Polychaeta) from China. ZooKeys 1068: 1–11. https://doi.org/10.3897/zookeys.1068.71925

Abstract

A new species of the orbiniid genus *Phylo* Kinberg, 1866, *P. heterochaetus* **sp. nov.**, is described based on material collected from the northern Yellow Sea, China. This is the thirteenth species in *Phylo*. The new species can be easily identified by the combination of the following characters: anterior thorax with 13 chaetigers, interramal cirri absent, anterior thoracic neuropodia with 4 or 5 rows of uncini, intermixed with a few subuluncini in the first 1 or 2 rows, and a ventral fringe of numerous stomach papillae present on chaetigers 12–24. *Phylo fimbriata* is recorded for the first time from China seas.

Keywords

China Seas, new record, *Phylo*, taxonomy

Introduction

Phylo Kinberg, 1866 belongs to Orbiniidae Hartman, 1942 and differs from the other genera of that family in having species with modified spines on posterior thoracic chaetigers. Although species of *Phylo* are closely related to *Orbinia* species based on

Copyright *Yue Sun et al.* This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

molecular analyses (Bleidorn 2005; Bleidorn et al. 2009), *Phylo* is retained as a genus because the presence of posterior thoracic modified spines is a distinctive and easily recognized characteristic for species of *Phylo* (Blake 2017). Hartman (1957) reviewed this genus and described four species in detail, including the type species, *P. felix* Kinberg, 1866. Subsequently, Day (1961, 1977), Mohammad (1980), Hartmann-Schröder and Rosenfeld (1990), and Blake (2017, 2020, 2021) described additional *Phylo* species. According to this literature, 14 species of *Phylo* are currently recognized and considered valid (Blake 2021; Read and Fauchald 2021).

The genus *Phylo* is characterized as follows: branchiae first present from chaetiger 5–7; thoracic neuropodia fringed, with several postchaetal lobes; posterior thorax and anterior abdominal chaetigers with subpodial lobes, usually forming a ventral fringe; thoracic neurochaetae including blunt uncini or subuluncini and crenulated capillaries; posterior thoracic chaetigers with modified spines.

According to Liu (2008), four species have been documented from Chinese waters: *Phylo felix*, *Phylo ornatus* (Verrill, 1873), *Phylo kupffferi* (Ehlers, 1874), and *Phylo nudus* (Moore, 1911). We checked specimens previously identified as *P. felix* deposited in the Marine Biological Museum of the Chinese Academy of Science and found the report of the species from Chinese waters to be a misidentification. These specimens were identified as a new species, which is described and illustrated in this study. Additionally, we describe and illustrate *Phylo fimbriata* based on specimens collected from the East China Sea. This is the first record of *P. fimbriata* from Chinese waters.

Material and methods

Material checked in this study was collected from the northern Yellow Sea and East China Sea and deposited in the Marine Biological Museum of Chinese Academy of Science, with a few specimens retained by the present college of the first author (Yancheng Teachers University, YCTU). All the specimens were preserved in 75% ethanol solution. Detailed morphological structures were examined under a Zeiss Stemi 2000-C stereomicroscope. Photography and line drawings were made using an AxioCam MRc 5 digital camera attached to a stereomicroscope and a compound microscope. Specimens were stained with rose bengal to observe details of parapodial lobes and subpodial lobes. For SEM observations, selected parapodia were detached from the specimens, rinsed in absolute ethanol, dehydrated, coated in gold, observed, and photographed using a scanning electron microscope.

The following abbreviations are used:

MBM	Marine Biological Museum;	**ECS**	East China Sea;
YCTU	Yancheng Teachers University;	**nYS**	northern Yellow Sea;
spec	specimen;	**SEM**	scanning electron microscope.
Sta.	station;		

Taxonomy

Family Orbiniidae Hartman, 1942
Subfamily Orbiniinae Hartman, 1942

Genus *Phylo* Kinberg, 1866

Type species. *Phylo felix* Kinberg, 1866

***Phylo heterochaetus* sp. nov.**
http://zoobank.org/AAAAD262-9B46-4B96-BD38-F6FBF8F7D5A3
Figures 1–3

Material examined. ***Holotype*:** MBM286984: nYS, Sta. 3875–04, 38°45'N, 123°30'E, 64 m, 16 Dec. 2015. ***Paratype*:** MBM286985: nYS, Sta. 16, 39°07'N, 122°54'E, 31 m, 18 Dec. 2016. MBM286986: nYS, Sta. C3, 39°00'N, 122°55'E, 45 meters, 18 Dec. 2016. Sta. MBM286987: nYS, Sta. A1, 39°05'N, 122°35'E, 36 m, 18 Dec. 2016. MBM023255: nYS, Sta. 2049, 122°45'N, 38°09'E, 51 m, coll. Mu Chen. 11 Jul. 1959.

Additional material. MBM023221: nYS, Sta. 2056, 38°30'N, 123°30'E, 63 m, Mu Chen. 15 Apr. 1959. MBM009975: nYS, Sta. 2057, 38°00'N, 123°30'E, 70.5 m, coll. Yuheng Cui. 1 Oct. 1958. YCTU000004: nYS, Sta. A3, 39°00'N, 122°35'E, 35 m, 18 Dec. 2016. YCTU000005: nYS, Sta. 48, 39°16'N, 123°18'E, 37 m, 18 Dec. 2016.

Description. All specimens incomplete, posterior end missing, holotype with 60 chaetigers, 34 mm long and 5 mm wide. Body elongate, about same width throughout; thorax depressed, abdomen cylindrical.

Prostomium short, conical, tapering to rounded tip; eyepots absent, nuchal organs narrow groove at junction with peristomium (Fig. 1). Peristomium a narrow asetigerous segment, distinctly separated from prostomium and chaetiger 1; mouth with anterior oral lip arising from posterior margin of peristomium, posterior oral lip from anterior margin of chaetiger 2. Holotype with proboscis everted, consisting of two large, inflated lobes (Fig. 1).

Holotype with 21 thoracic chaetigers, divided into anterior and posterior sections: anterior thorax with 13 chaetigers (Figs 1, 2A), posterior thorax with modified spines beginning on chaetiger 14 continuing over 8 chaetigers. Intersegmental annulations first present from chaetiger 1, well developed (Figs 1, 2A). Thoracic notopodial postchaetal lobe arising from narrow base, broadly triangular, narrowing apically (Fig. 2B), becoming long and narrow in abdominal chaetigers (Fig. 2C, D). Thoracic neuropodia thick, elongate, fringed, bearing rows of uncini and several capillaries. First chaetiger with 2 rounded postchaetal lobe, increasing to 13–14 on middle thoracic chaetigers (Fig. 2A), then decreasing to 6 or 7 on last thoracic chaetigers. Subpodial lobes or

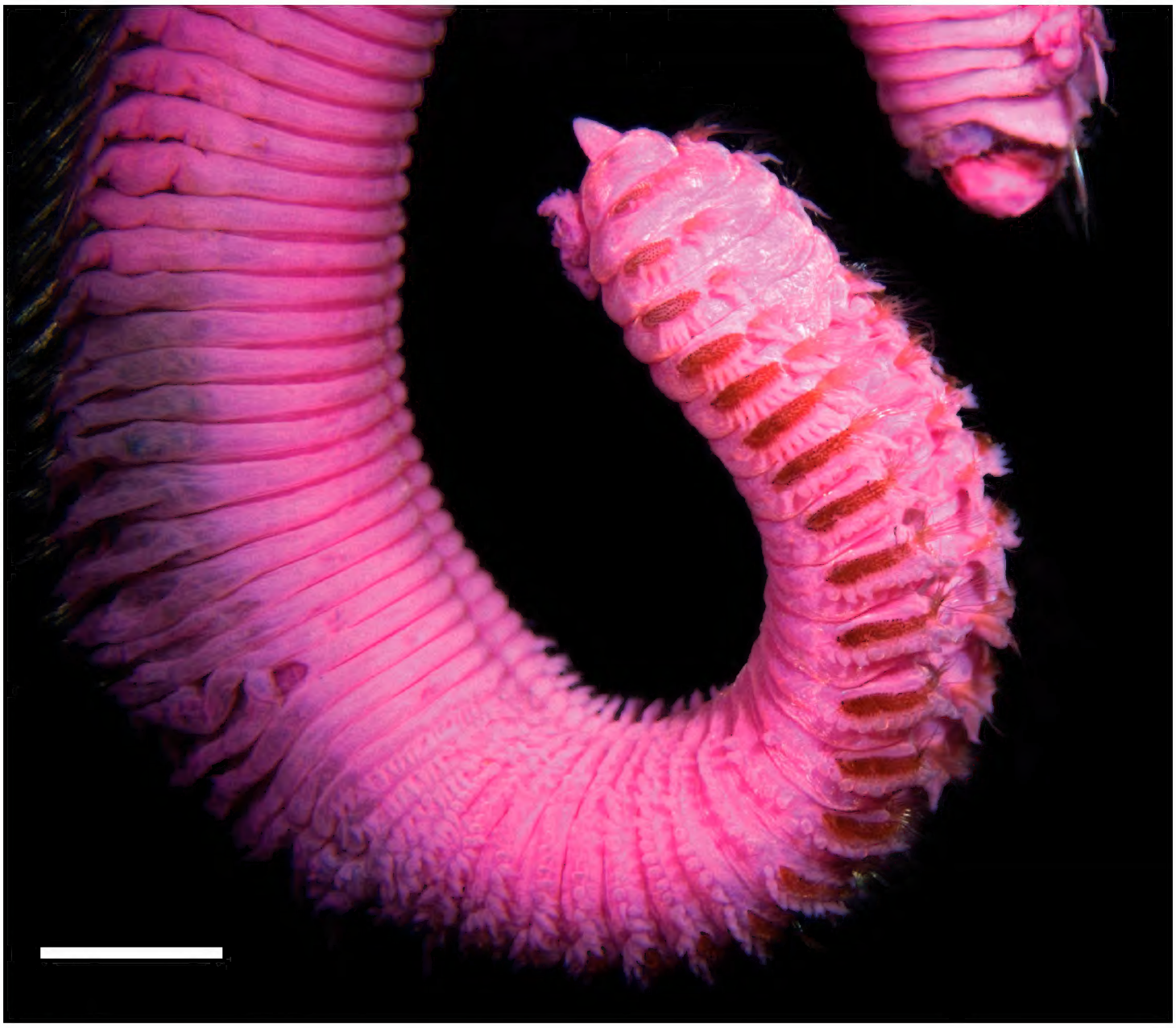

Figure 1. Anterior end of *Phylo heterochaetus* sp. nov. Scale bar: 2 mm.

stomach papillae from chaetiger 12, numbering 1 at first, then extending to ventral midline on chaetigers 18–25, then abruptly absent (Figs 1, 2A). Abdominal neuropodia bilobed, with inner lobe blunt, outer lobe cirriform (Fig. 2C, D). First abdominal chaetiger with 6 extra lobes or ventral cirri ventral to neuropodium, then reduced to 2 on following 3 chaetigers and 1 or 2 on subsequent chaetigers (Fig. 2C, D). Interramal cirrus absent.

Branchiae from chaetiger 5, on anterior chaetigers short, triangular, tapering to narrow papillate rounded apex (Fig. 2B), then becoming narrower and longer, leaf-like and ciliated (Fig. 2C, D).

Thoracic notopodia with fascicles of crenulated capillaries. Abdominal notopodia with few long, thin capillaries, 2–4 furcate chaetae and 3–5 imbedded aciculae, furcate chaetae with unequal tynes, each tyne with fine needles directed medially, shaft with transverse rows of barbs (Fig. 3E).

Anterior thoracic neuropodia with 4 rows and 1 short posterior rows of yellow uncini, and posterior row of crenulate capillaries (Figs 2E, 3A, B, E, F). Anterior 2 rows mixed with 10–12 subuluncini, last row with 7–9 uncini, curved ventrally to

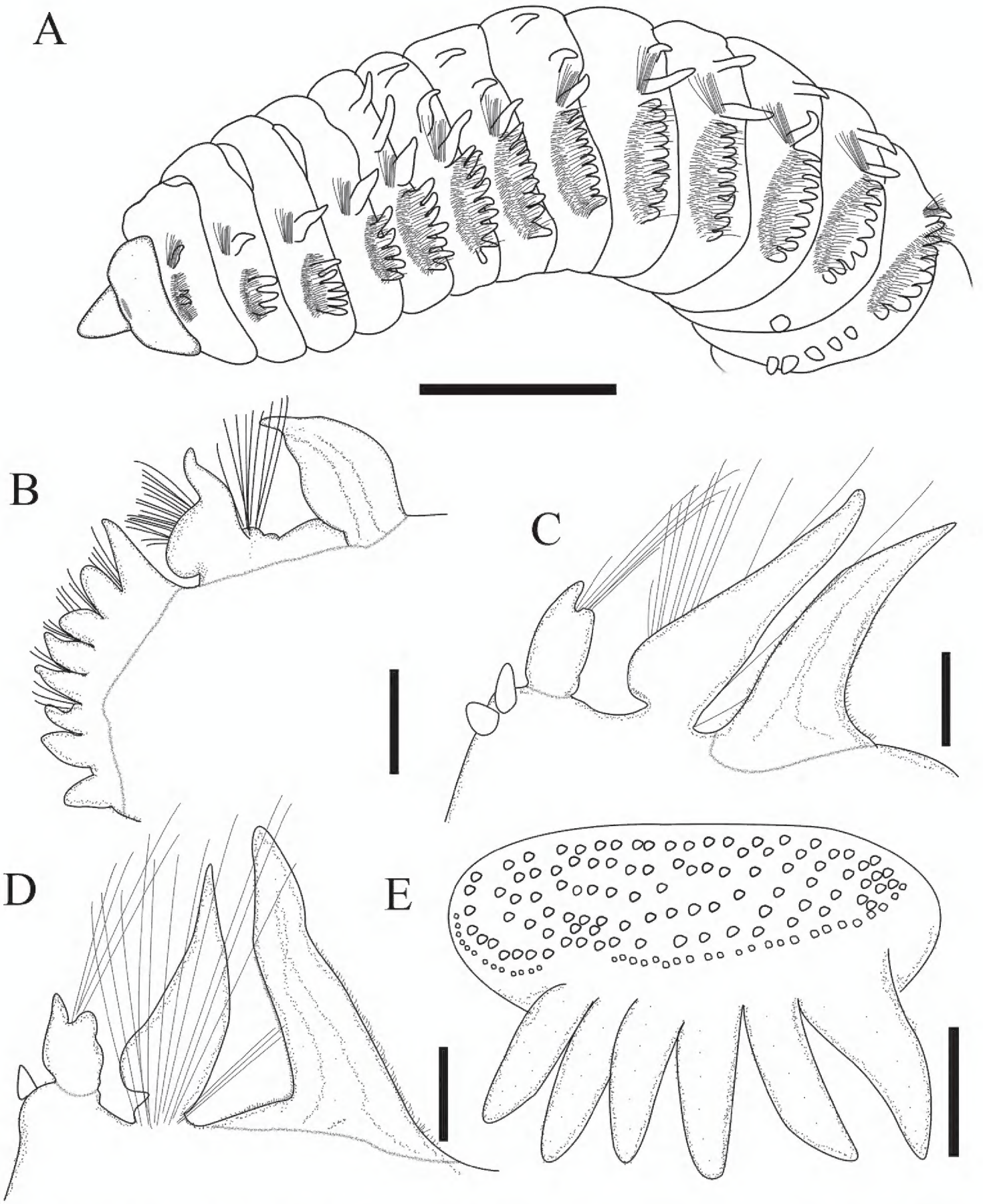

Figure 2. *Phylo heterochaetus* sp. nov. **A** anterior body in lateral view **B** parapodium of chaetiger 7 **C** parapodium of anterior abdominal chaetiger **D** parapodium of chaetiger 62 **E** diagram showing arrangement of anterior thoracic neurochaetae. Scale bars: 2 mm (**A**); 400 μm (**B–D**); 200 μm (**E**).

anterior rows (Fig. 3A, B). Uncini of first 1–4 rows short, with blunt-tipped apex, with 10–18 transverse rows of blunt barbs on convex side, with conspicuous groove apically (Fig. 3B, D); uncini of last row longer than anterior ones, only located in ventral side of neuropodium (Fig. 3A); subuluncini resemble uncini, but with distally pointed tip,

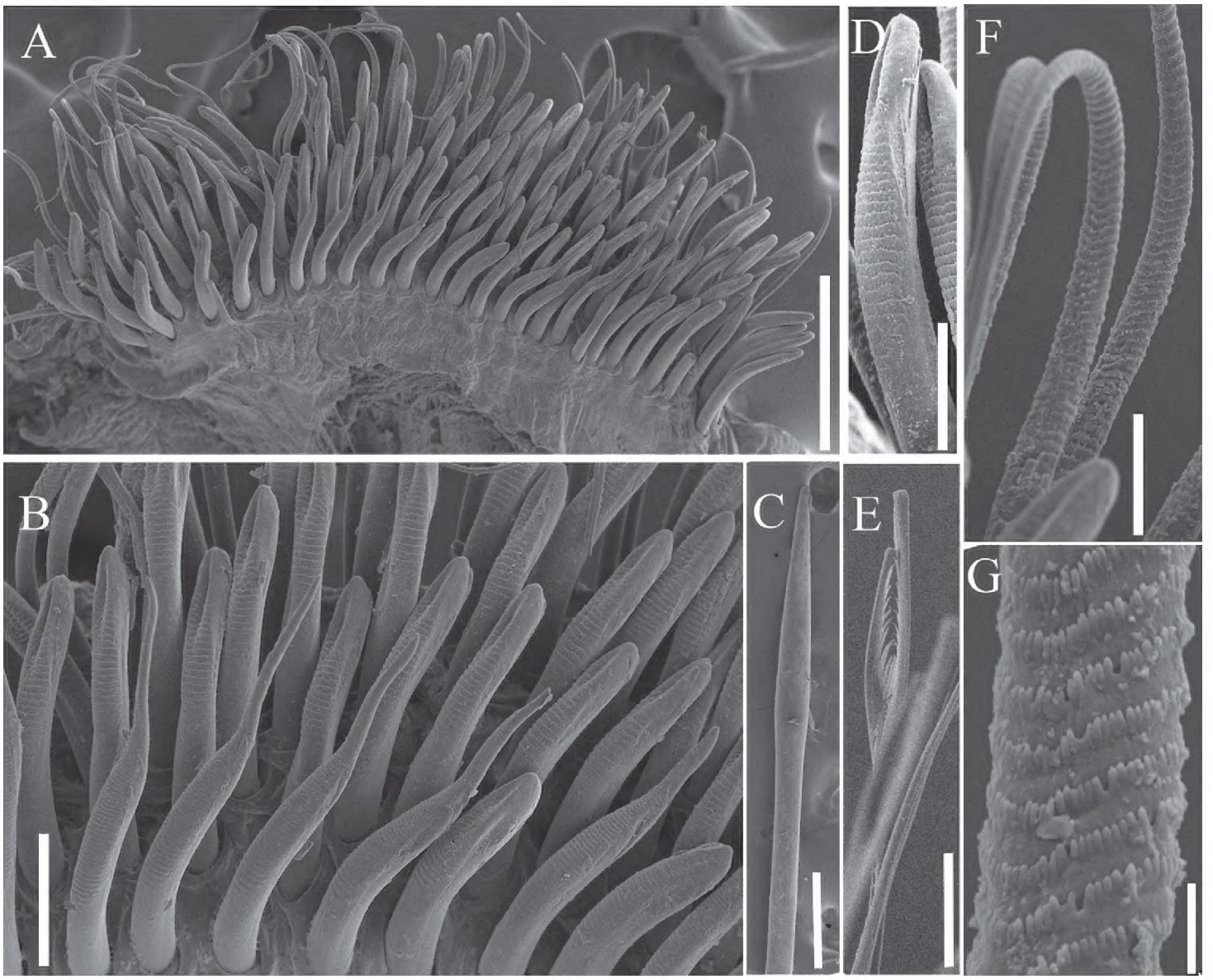

Figure 3. SEM pictures of *Phylo heterochaetus* sp. nov. **A** neurochaetae of thorax **B** uncini and subuluncini **C** modified spines **D** uncini of last rows of thoracic neuropodia **E** furcate chaeta **F, G** crenulate capillaries. Scale bars: 250 μm (**C**); 200 μm (**A, E, F**); 50 μm (**B**); 30 μm (**G**); 10 μm (**D**).

with more than 30 rows of blunt barbs, surrounded by sheath (Fig. 3B). Posterior thoracic neuropodia with 4–7 modified spines (Fig. 3C), single short row of uncini and 1 or 2 rows crenulate capillaries. Modified spines large, hastate, superior one projecting from neuropodium, with glandular pouch (Fig. 3C). Abdominal neurochaetae including 4–6 thin capillaries and single acicula, thin and imbedded.

Anterior thoracic neuropodia with 5 or 6 rows of yellow uncini and posterior row of crenulate capillaries (Figs 2E, 3A, B). Anterior 2 rows mixed with 10–12 subuluncini, last row with 7–9 uncini, curved ventrally to anterior rows (Fig. 3A, B). Uncini of anterior 4 or 5 rows short, with blunt-tipped apex, with 10–18 transverse rows of blunt barbs on convex side, with conspicuous groove apically (Fig. 3B, D); uncini of last row longer than anterior ones, only located in ventral side of neuropodium (Fig. 3A). Subuluncini resemble uncini but with distally pointed tip, with more than 30 rows of blunt barbs, surrounded by sheath (Fig. 3B). Posterior thoracic neuropodia with 4–7 modified spines (Fig. 3C), single short row of uncini and 1 or 2 rows crenulate capillaries. Modified spines large, hastate, superior one projecting from neuropodium (Fig. 3C). Abdominal neurochaetae including 4–6 thin capillaries and single acicula, thin and imbedded.

Pygidium not observed.

Variation. One paratype (MBM286986) with 13 and 14 anterior thoracic chaetigers on left and right side respectively, posterior thorax with 9 and 8 chaetigers, respectively. Holotype and other specimens with 13 anterior thoracic chaetigers, posterior thorax with 4–8.

Etymology. The species is named for the thoracic neuropodia with two kinds of uncini.

Type locality. Northern Yellow Sea, China.

Remarks. This species is unusual in the genus in having anterior thoracic neuropodia with 5 or 6 rows of uncini intermixed with a few subuluncini in the first 1 or 2 rows. *Phylo heterochaetus* sp. nov. is similar with *P. ornatus* (Verrill, 1873) for: 1) anterior thoracic neuropodia with rows of uncini, 2) lacking interramal cirri, 3) anterior thorax with 13 or 14 chaetigers. They can be easily distinguished by 1) species of *P. heterochaetus* sp. nov. with 4–8 posterior thoracic chaetigers, while the latter species with 13 or more chaetigers; 2) species of *P. heterochaetus* sp. nov. with 10 or 11 subuluncini intermixed with first 2 rows uncini, while the latter species lacks subuluncini; 3) modified spines hastate in *P. heterochaetus* sp. nov. and acicular in *P. ornatus*.

Phylo fimbriata (Moore, 1903)

Figures 4–6

Aricia fimbriata Moore, 1903: 464–467, pl. XXIV, figs 33–35; Okuda 1937: 99–101, figs 1, 2.

Phylo fimbriata: Hartman 1957: 267.

Material examined. YCTU000006: ECS, Sta. 3100–8, 31°00'N, 126°00'E, 51 m, soft mud substrate, Jun. 2014. YCTU000007: ECS, Sta. I3, 33°00'N, 123°00'E, 34 m, soft mud substrate, 20 Sep. 2015. MBM009966: ECS, Sta. 4134, 29°30'N, 123°00'E, 50 m, soft mud substrate, 20 Jan. 1959. MBM 023276: ECS, Sta. 4007, 33°30'N, 122°30'E, 37 m, soft mud substrate, 13 Apr. 1959.

Description. All specimens incomplete, posterior end missing. Body elongate, about same width throughout; thorax depressed, abdominal chaetigers cylindrical.

Prostomium short, conical, tapering to rounded tip; eyepots absent; nuchal organs narrow groove at junction with peristomium. Peristomium an asetigerous segment, distinctly separated from prostomium and chaetiger 1; mouth with anterior oral lip arising from posterior margin of peristomium, posterior oral lip from anterior margin of chaetiger 2. Proboscis everted, consisting of 2 large, inflated lobes.

Thorax with 16 chaetigers, divided into anterior and posterior sections: anterior thorax with 12 chaetigers, posterior thorax with modified spines from chaetiger 13 continuing over 4 chaetigers. Intersegmental annulations first present from chaetiger 1, well developed (Fig. 4A).

Both thoracic notopodia and neuropodia with fringed postchaetal lobes; notopodium half as broad as the neuropodium, broadly palmate (Figs 4A, 5A). Notopodia

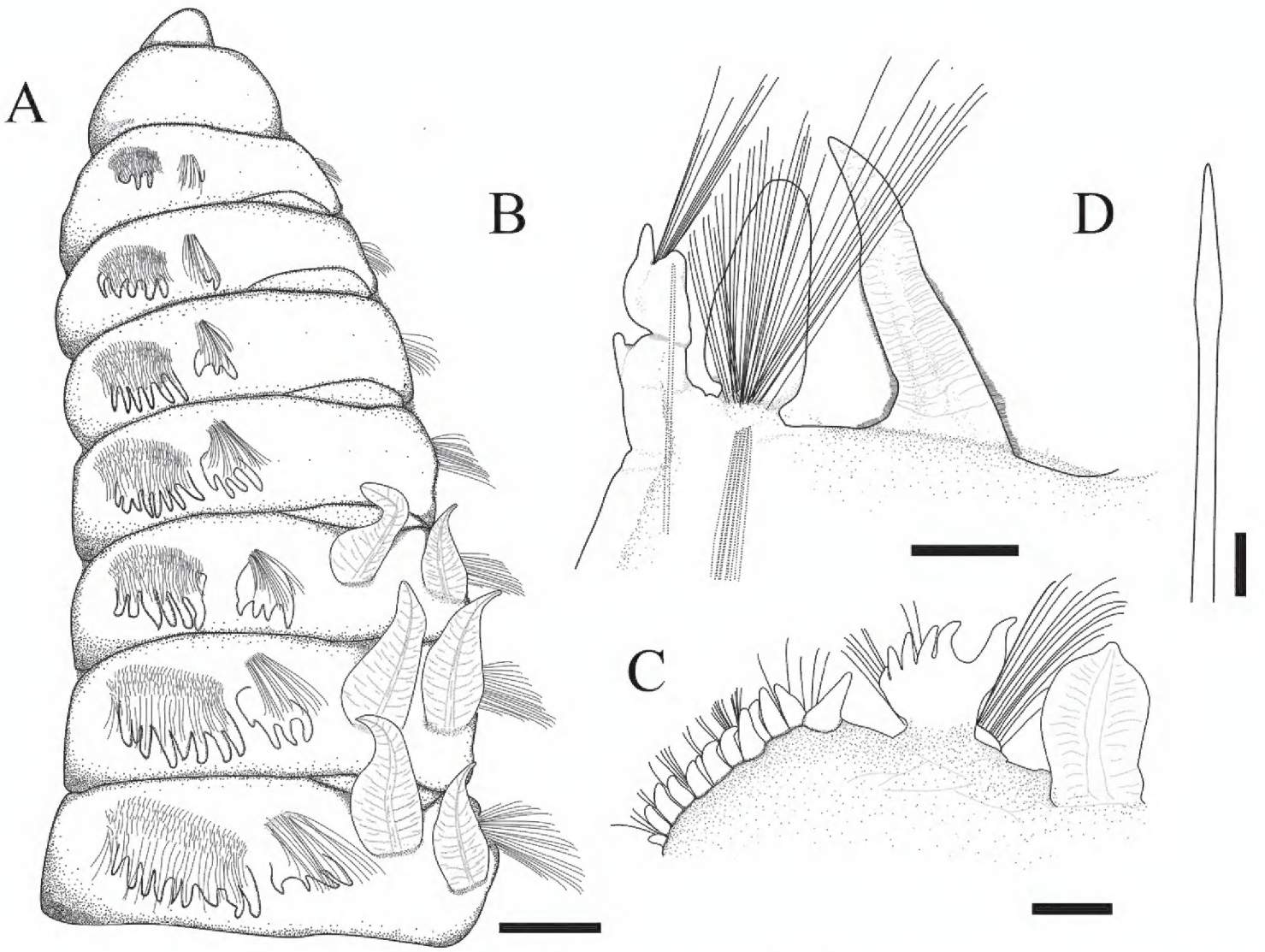

Figure 4. *Phylo fimbriata* (Moore, 1903) **A** anterior end, left lateral view **B** parapodium of abdominal chaetigers; **C** parapodium of thoracic chaetigers **D** modified spine from posterior thoracic chaetiger. Scale bars: 1 mm (**A**); 500 μm (**B–D**).

with single conical postchaetal lobe from chaetiger 1, increasing gradually to about 6 lobes on posterior thoracic chaetigers; postchaetal lobes equivalent in size and shape on anterior chaetigers, with inner lobe separate and becoming longer than the outer ones on the posterior chaetigers (Fig. 4A, C). Abdominal notopodial postchaetal lobe arising from narrow base, broadly triangular (Fig. 4B).

Thoracic neuropodia thick, elongate, strictly lateral, bearing numerous subuluncini and capillaries (Fig. 4A, C). Neuropodium with 1–3 conical postchaetal lobes from chaetiger 1, increasing gradually to about 15 lobes on chaetigers 9 (Figs 4A, C, 6A). Subpodial lobes or stomach papillae present on chaetiger 17–19, numbering 2 or 3. Abdominal neuropodia bilobed, with inner lobe blunted, outer lobe cirriform (Fig. 4B). First abdominal chaetiger with 3–6 extra lobes or ventral cirri ventral to neuropodium, then reduced to a single cirrus on subsequent chaetigers (Fig. 4B). Interramal cirrus absent.

Branchiae from chaetiger 5, each anterior branchia broad, tapering to narrow rounded tip (Fig. 4C), subsequent branchiae narrower and longer, leaflike and ciliated (Fig. 4B).

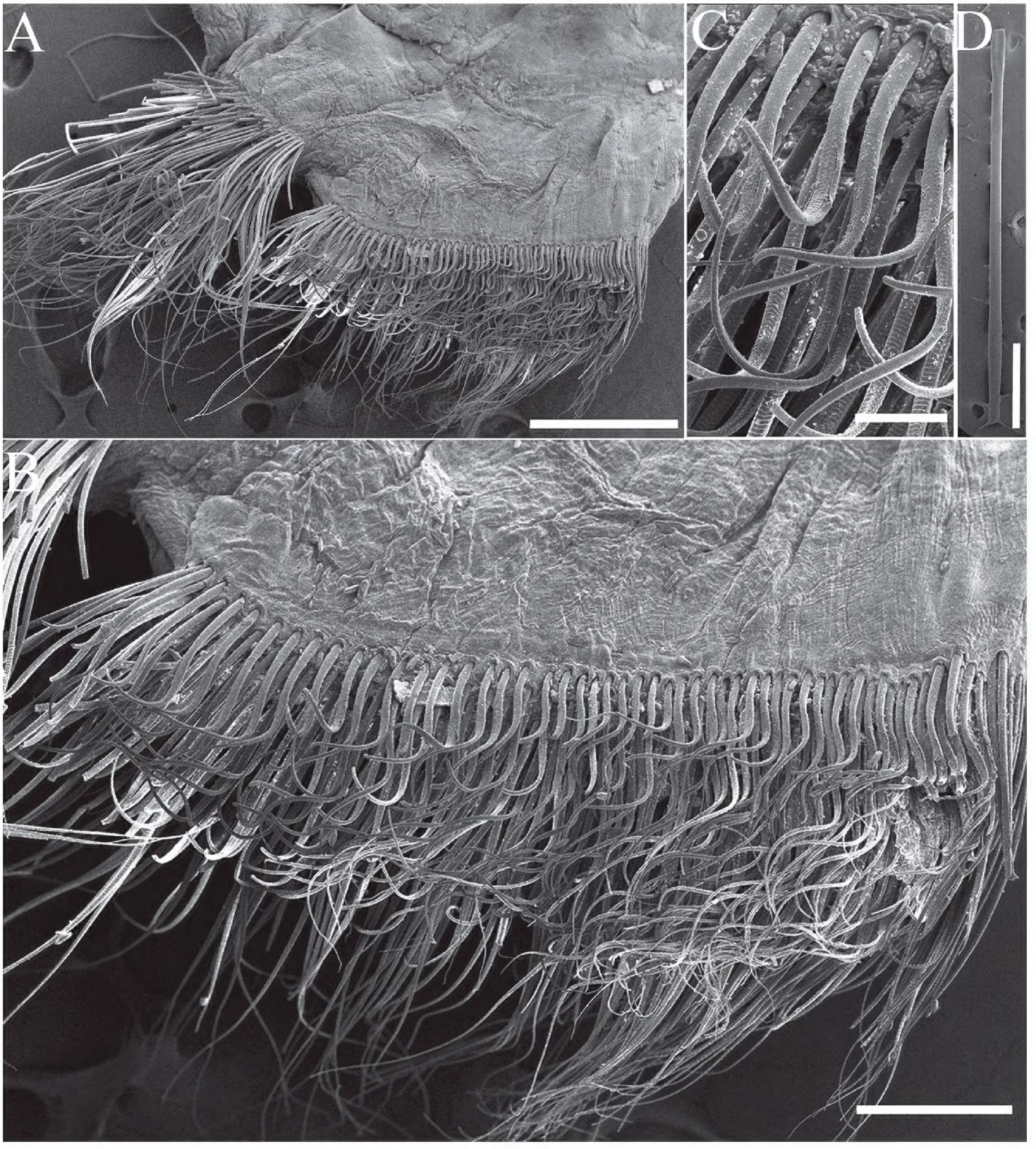

Figure 5. SEM pictures of *Phylo fimbriata* (Moore, 1903) **A** anterior thoracic chaetiger, anterior view **B** same, detail, showing arrangement of neurochaeta **C** same, detail, showing neurochaetae **D** modified spines. Scale bars: 5 mm (**A, D**); 200 μm (**B**); , 50 μm (**C, D**).

Thoracic notopodia with fascicles of crenulated capillaries (Figs 5A, 6A, B). Abdominal notopodia with fewer long, thin capillaries, 3 or 4 furcate chaetae and 4–8 imbedded aciculae (Fig. 4B). Anterior thoracic neuropodia with numerous yellow subuluncini and crenulated capillaries (Figs 5B, 6A). Subuluncini arranged in dense phalanx, with anterior ranks strongly curved, much shorter than posterior ranks (Fig. 5A, B). Subuluncini tapering to narrow pointed tip, covered with sheath, shaft with transverse rows of minute ribs or barbs (Fig. 5C). Posterior thoracic neuropodia with 4 or 5

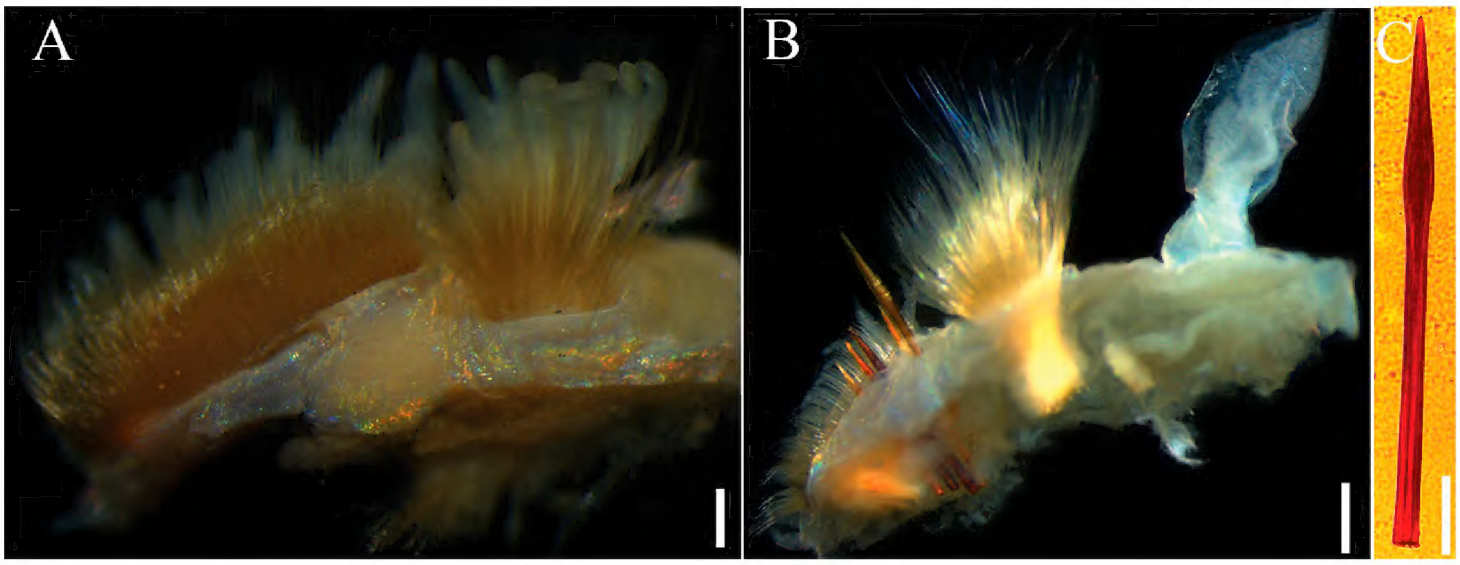

Figure 6. *Phylo fimbriata* (Moore, 1903) **A** anterior thoracic chaetiger, anterior view **B** posterior thoracic chaetiger, anterior view **C** modified spines. Scale bars: 0.5 mm (**B, C**); 0.2 mm (**A**).

modified spines, several subuluncini and crenulated capillaries ventral to the modified spines (Fig. 6B). Modified spines large, superior one projecting from neuropodium, with glandular pouch (Figs 4D, 5D, 6B, C). Abdominal neurochaetae including thin capillaries and 1–3 aciculae (Fig. 5B).

Pygidium not observed.

Distribution. East China Sea (China); Suruga Bay, Miyagi Prefecture (Japan).

Remarks. *Phylo fimbriata* (Moore, 1903), which was first reported by Moore (1903) from Suruga Bay and North Japan, has fringed postchaetal lobes on the thoracic notopodia unlike most species of *Phylo*. Okuda (1937) redescribed this species based on specimens from Miyagi Prefecture. The morphology of present specimens agrees well with the original description of specimens from Japan.

Acknowledgements

We thank the managers of the Marine Biological Museum of the Chinese Academy of Sciences for their help in sorting the studied material. This study was supported by the National Natural Science Foundation of China (no. 32000349), Jiangsu Provincial Key Laboratory for Bioresources of Saline Soils Open Foundation (no. JKLBS2019004).

References

Blake JA (2017) Polychaeta Orbiniidae from Antarctica, the Southern Ocean, the abyssal Pacific Ocean, and off South America. Zootaxa 4218(1): 1–145. https://doi.org/10.11646/zootaxa.4218.1.1

Blake JA (2020) New species and records of deep-water Orbiniidae (Annelida, Polychaeta) from the eastern pacific continental slope, abyssal Pacific Ocean, and the South China Sea. Zootaxa 4730(1): 1–61. https://doi.org/10.11646/zootaxa.4730.1.1

Blake JA (2021) New species and records of Orbiniidae (Annelida, Polychaeta) from continental shelf and slope depths of the western North Atlantic Ocean. Zootaxa 4930(1): 1–123. https://doi.org/10.11646/zootaxa.4930.1.1

Bleidorn C (2005) Phylogenetic relationships and evolution of Orbiniidae (Annelida, Polychaeta) based on molecular data. Zoological Journal of the Linnean Society 144: 59–73. https://doi.org/10.1111/j.1096-3642.2005.00160.x

Bleidorn C, Hill N, Erséus C, Tiedemann R (2009) On the role of character loss in orbiniid phylogeny (Annelida): molecules vs. morphology. Molecular Phylogenetics & Evolution 52: 57–69. https://doi.org/10.1016/j.ympev.2009.03.022

Day JH (1961) The polychaete fauna of South Africa. Part 6. Sedentary species dredged off Cape coasts with a few new records from the shore. Journal of the Linnean Society of London 44(299): 463–560. https://doi.org/10.1111/j.1096-3642.1961.tb01623.x

Day JH (1977) A review of the Australian and New Zealand Orbiniidae (Annelida: Polychaeta). In: Reish DJ, Fauchald K (Eds) Essays on Polychaetous Annelids in Memory of Dr. Olga Hartman. Allan Hancock Foundation, University of Southern California, Los Angeles, 217–246.

Hartman O (1957) Orbiniidae, Apistobranchidae, Paraonidae and Longosomidae. Allan Hancock Pacific Expeditions 15(3): 211–393. [pls 20–44, 1 chart]

Hartmann-Schröder G, Rosenfeldt P (1990) Die Polychaeten der "Walther Herwig" – Reise 68/1 nach Elephant Island (Antarktis) 1985. Teil 1: Aphroditidae bis Cirratulidae. Mitteilungen des Hamburgischen Zoologischen Museums und Instituts, Supplement 87: 89–122.

Kinberg J (1866) Annulata nova. Öfversight af Kungliga Vetenskaps-Adakemiens Förhandlingar 22: 239–258.

Mohammad M-BM (1980) Polychaete annelids from Kuwaitian islands, Arabian Gulf, with descriptions of four new species. Zoological Journal of the Linnean Society 69(1): 31–42. https://doi.org/10.1111/j.1096-3642.1980.tb01931.x

Moore JP (1903) Polychæta from the coastal slope of Japan and from Kamchatka and Bering Sea. Proceedings of the Academy of Natural Sciences of Philadelphia 55: 401–490.

Okuda S (1937) Some ariciid worms from Japan. Annotationes Zoologicae Japanenses 16: 99–105.

Read G, Fauchald K [Ed.] (2021) World Polychaeta Database. Phylo Kinberg, 1866. Accessed through: World Register of Marine Species. http://www.marinespecies.org/aphia.php?p=taxdetails&id=129421 [Accessed on 2021-07-20]

Verrill AE (1873) Report upon the invertebrate animals of Vineyard Sound and the adjacent waters with an account of the physical characteristics of the region. Report of the U.S. Fisheries Commission 1871–1872: 295–778. https://doi.org/10.5962/bhl.title.57652